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(54) Title: A METHOD AND DEVICE FOR DIRECTLY TRANSFERRING IMAGES			
(57) Abstract <p>The method comprises a step in which a predetermined quantity of air is heated up inside a variable volume (9) as a function of the size of the image to be transferred. The hot air is directed towards the inked temperature-sensitive band or strap, by means of a diffuser (7) which creates a hot air cushion or "equipotential plane".</p>			

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DescriptionA method and device for directly transferring imagesTechnical Field

The present invention relates to a method and a device for directly marking the surface of objects having a plane or curved form, by transfer of the ink which is present on a temperature-sensitive band, and by using a jet (current) of hot air, which pushes the temperature-sensitive band against the object.

In particular, the images transferred on the object may be a bar code, a logo (logotype), a text, etc.

10

Background Art

The prior art uses different methods in order to transfer images on a sheath, a packing, a plastic object, etc.

15 There have been already produced kinds of printers which employ a pad in order to press the inked band or strap against the object, for transferring the images.

Other methods of direct transfer of images, i.e. those which do not make use of pressure sensitive (adhesive)

20 labels, are the following:

- the marking with thermal transfer of images by means of a cliché;
- the direct thermal transfer printing on objects.

25 Disclosure of Invention

An object of the present invention is that of providing

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a method and a related device for carrying out such method, whereby the transfer occurs through a hot air jet (current) under controlled temperature and pressure conditions, said jet being distributed uniformly on the  
5 portion of the inked temperature;

- sensitive band or strap which bears the positive or negative image, in order to push that portion of the band or strap against the flat or curved surface of the object.

10

#### Brief Description of Drawings

The present invention will now be described for illustrative and non-limitative purposes by means of a preferred embodiment thereof, which is shown in the only  
15 figure annexed to this document, representing a front and partially sectional view of the device.

#### Best Mode of Carrying out the Invention

The device shown in Fig. 1 may be incorporated in an  
20 usual electronic thermal transfer printer.

The device in Fig. 1 comprises a temperature-sensitive printing band or strap associated to a respective pay-off roller or decoiler 2 and a take-up roller or coiler  
3. The reference numbers 4a and 4b indicate band  
25 tightening rollers or briefly, tighteners.

The central part 5 of the device is the innovative part, which directs the hot air jet against the part, which directs the hot air jet against the Central horizontal

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section 1' of the inked temperature sensitive band 1.  
Said horizontal section 1' is located at a predetermined distance from the object 6, which, even if it has a flat surface in the figure, may have a curved form whatever.

5 In fact, the hot air which leaves the diffuser 7 of compressed air, pushes the band 1 against the object 6, conforming to the shape of the latter, as will be explained later on. The central part 5 comprises a compressed air inlet duct 8 (for instance connected to a  
10 compressor), by means of which cold air is introduced inside a chamber with variable volume 9. The cold air is feeded into the variable volume chamber air 9 at a predetermined pressure (preferably from about 0,5 to about 8 bar) adjusted by a flow control valve 10, which  
15 is set either manually or automatically, depending on the size of the image to be transferred.

The variable volume chamber 9 comprises an upper part 11a and a lower part 11b; the latter one may be vertically displaced in order to increase or decrease  
20 the extension of the inner space of the variable volume chamber 9. This operation is done automatically. The volume of the variable volume chamber 9 is adjusted as a function of the dimensions of the image to be transferred, and internally it includes an electric  
25 resistance 12 having the shape of a coil 9 which heats the air inside the variable volume chamber.

Reference numeral 13 denotes a control circuit which closes the flow control valve 10, when a predetermined

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amount of air has entered the variable volume chamber 9, and the pressure of this air has reached the pressure value adjusted by the flow control valve 10.

At this moment, while the variable volume chamber 9 is  
5 hermetically sealed, the electric resistance 12 is heated up through the control circuit 13.

The temperature of the air inside the variable volume chamber 9 is adjusted and maintained constant by means of a thermostat (not shown), at a value preferably  
10 between 40 and 700°C, depending on the kind of band or strap being employed and suited for thermal transfer of images.

The air contained in the variable volume chamber 9 will be, as a whole, maintained at a constant pressure and  
15 temperature.

In consequence of the automatic control obtained through the control circuit 13, the solenoid valve 14 is operated, so as to let the air flow out of the chamber 9, introducing it in the diffuser 7, or air expansion  
20 device, or air sprayer.

The diffuser 7 forms an "equipotential plane", that is, the heat flow which passes through the unit of area on the plane located at the outlet 15 of the diffuser 7, is the same at every point on this plane. Furthermore, the  
25 pressure of the air which flows out of the diffuser 7, is the same at every point of said plane. The term "equipotential" means that both conditions are satisfied.

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In this manner, the pressure exerted on the portion concerned of the temperature-sensitive band or strap and the heating produced, will be the same at every point, allowing an optimum transfer of the image on the object.

5 In order to speed up the emptying operation of the chamber 9, the flow control valve 10 may be opened simultaneously to the solenoid valve 14, introducing (cold) air into the chamber 9, which pushes downwardly the hot air contained in the chamber 9.

10 As shown in the figure, the section 1' of the temperature-sensitive band 1 is located at a variable distance from the diffuser 7, depending on the chosen volume of the variable volume chamber 9. The hot air is "sprayed" by the diffuser 7 on the band or strap 1', and  
15 the latter thermically transfers the image on the surface of the object 6 conforming to the shape thereof.



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Claims

1. A method for directly transferring images on objects, by means of an inked temperature-sensitive band or strap, characterized in that it comprises the following steps:

- 5     i) Hot air is stored at a controlled temperature and pressure, inside a variable volume chamber (9), whose volume is chosen according to the dimensions of the image to be transferred;
- 10    ii) A valve (14) is opened in order to let the stored hot air flow out through a diffuser (7) which produces an "equipotential plane" or air cushion, through which a constant pressure and a constant heat flow is obtained at every point of the temperature sensitive band or strap (1), the latter being pushed against the surface
- 15    of the object, thus conforming to its shape and allowing the thermal transfer of the image.

2. A method according to claim 1, characterized in that the air is heated up directly inside the variable volume
- 20    chamber, through an electric resistance (12), to which a voltage is applied by means of a control circuit (13).

3. A method according to claim 2, characterized in that cold air is introduced into the variable volume chamber
- 25    (9) by means of a flow control valve (10) at a predetermined pressure which corresponds to the desired

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final pressure of the air inside the variable volume chamber (9) before its heating.

4. A method according to claim 1, characterized in that  
5 the temperature inside the variable volume chamber (9)  
is adjusted by a thermostat, which adapts this  
temperature to the kind of employed temperature-  
sensitive band or strap.
- 10 5. A method according to claims 1 to 4, characterized in  
that the valve (14) which allows the hot air stored  
inside the chamber (9) to flow out through the diffuser  
(7), is a solenoid valve controlled by the control  
circuit (13).
- 15 6. A method according to claims 1 to 5, characterized in  
that the valve (14) which allows the diffusion of hot  
air and which is operated through the control circuit  
(13), is opened simultaneously to the flow control valve  
20 (10), in order to speed up the emptying operation of the  
variable volume chamber (9).
7. A device for directly transferring images on objects,  
by means of an inked temperature-sensitive band or  
25 strap, comprising a take-up roller (3) and a pay-off  
roller (2), and a plurality of band tightening rollers  
(4a, 4b), characterized in that it comprises also a  
variable volume chamber (9) inside which hot air is

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stored at a constant pressure and temperature, said hot air being discharged through a diffuser (7) or air sprayer, when a valve (14) is opened.

5 8. A device according to claim 7, characterized in that the air is introduced into the variable volume chamber while it is still cold, by means of a flow control valve (10), the device comprising also an electric resistance (12) in the form of a coil which heats up the air inside  
10 the variable volume chamber (9) until a predetermined temperature is reached, suited to the quality of the employed temperature-sensitive band or strap.

9. A device according to any of the preceding claims,  
15 characterized in that the valve (14) which, when it is opened, causes the hot air to flow out of the chamber (9), is a solenoid valve (14); the device comprising also a control circuit (13) which besides heating up the electric resistance (12), automatically controls the  
20 opening and closing operations of the flow control valve (10) and of the solenoid valve (14).

10. A device according to any of the preceding claims, characterized in that the temperature of the air inside  
25 the chamber (9) is preferably adjusted so as to be included within an interval from about 40°C to about 700°C.

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11. A device according to any of the claims 8 to 10,  
characterized in that the flow control valve (10)  
adjusts the pressure of the cold air introduced into the  
variable volume chamber (9) in such a way that the value  
5 of this pressure is preferably included in the interval  
from about 0,5 bar to about 8 bar.

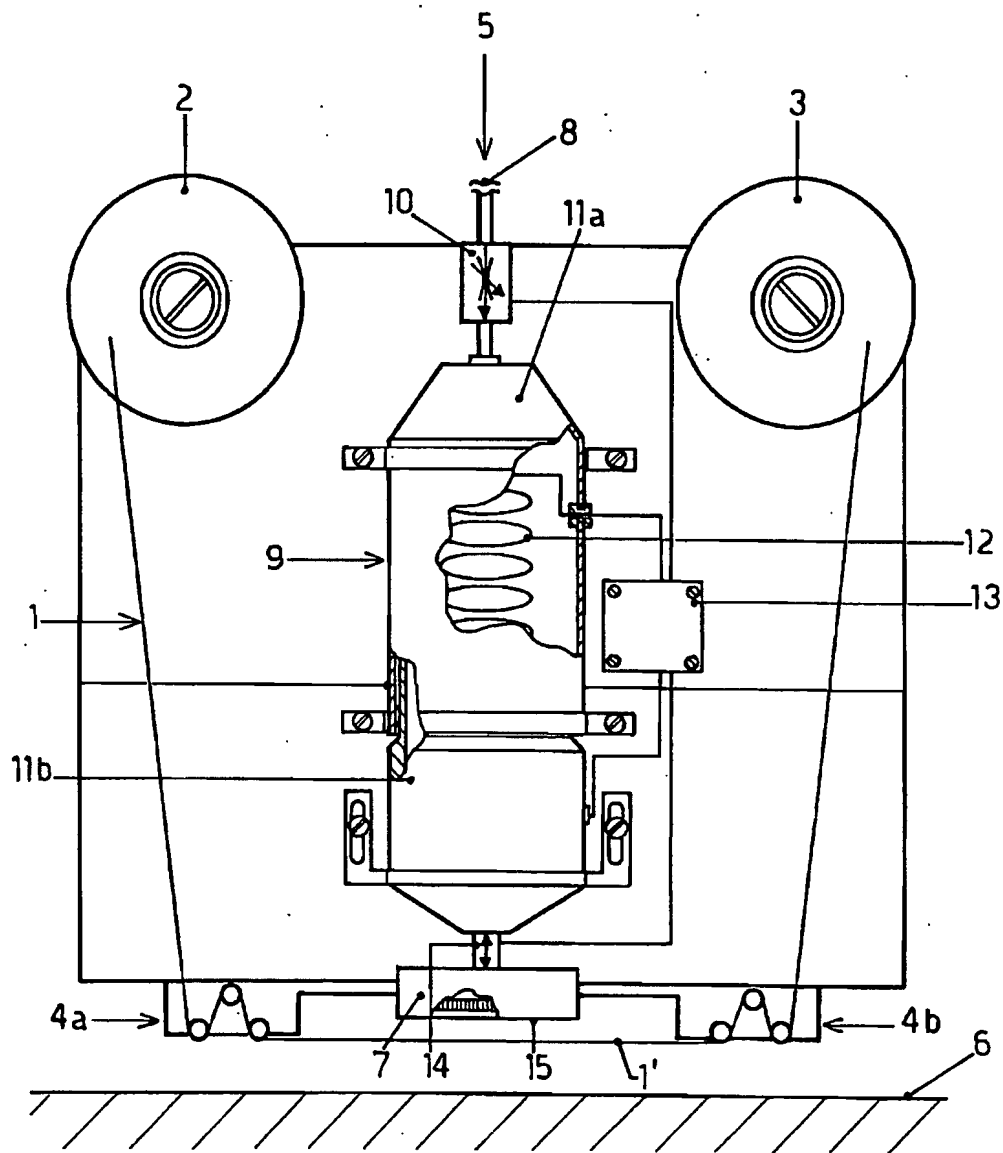


FIG. 1

## INTERNATIONAL SEARCH REPORT

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## A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B41M B41F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE,A,26 04 475 (IMPERIAL CHEMICAL INDUSTRIES PLC) 2 September 1976 see page 7, line 12 - line 23 see page 10, line 2 - line 19; claims 1-3; figure 1 ---	1-11
A	EP,A,0 110 220 (ROEHM GMBH) 13 June 1984 see page 16, line 1 - page 17, line 22; claims 1,2; figure 1 ---	1-11
A	EP,A,0 511 605 (C. BEUTELROCK) 4 November 1992 see column 2, line 17 - line 29; figure 1 see column 2, line 49 - column 3, line 47 see column 6, line 32 - column 7, line 21; claims 1-3 -----	1-11

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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EP-A-0511605	04-11-92	DE-A- 4113913	29-10-92